

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Appln. Of: BANISTER
Serial No.: 10/786,718
Filed: February 24, 2004
For: PULSE ACTIVATED ACTUATOR PUMP SYSTEM
Group: 3746 Confirmation No. 2762
Examiner: Freay, Charles Grant DOCKET: MEDIPACS 04.03

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
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Sir:

 This Appeal Brief under 37 C.F.R. §1.192 is submitted in support of the Notice of Appeal filed December 9, 2010 appealing to the Board from the action of the Patent Examiner's final Office Action, mailed November 23, 2010, finally rejecting pending claims 2, 3, 5-7, 17, 19-21, 24-26, 58-61 and 63-78 of the above referenced application.

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REAL PARTY IN INTEREST

The real party in interest of the instant application is Medipacs, Inc., the Assignee,
which is an Arizona Corporation.

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RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

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STATUS OF THE CLAIMS

Claims 2, 3, 5-7, 17, 19-21, 24-26, 58-61 and 63-78 are pending in the application. Claims 8-14, 16, 18 and 27-57 are withdrawn. Claims 2, 3, 5-7, 17, 19-21, 24-26, 58-61 and 63-78 stand finally rejected under 35 U.S.C. §103(a). The Appellant hereby appeals the foregoing final rejection for claims 2, 3, 5-7, 17, 19-21, 24-26, 58-61 and 63-78 that stand finally rejected under 35 U.S.C. §103(a).

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STATUS OF AMENDMENTS

A preliminary amendment was filed July 19, 2004 amending claims 1, 3-6, 12-14, 20, 25, 26, 29, 30, 36, 43, 46, 48-50, 54, and added new claims 56 and 57. A response to a July 3, 2007 Species Election requirement was filed electing Species I consisting of claims 1-10, 12-15, 17, 19-26, 34-48, and 50-57. A response to an October 9, 2007 second Species Election requirement was filed electing Species 2. A response to a November 29, 2007 Office Action was filed confirming election of Species 2 consisting of claims 1-10, 12-15, 17, 19-26 and 34-41. A response to a March 5, 2008 non-final Office Action was filed with amending claims 1, 7 and 26. A Request for Continued Examination was filed in response to the Final Office Action of September 16, 2008 amending claim 1. A response to a January 2, 2009 non-final office action was filed canceling claims 22 and 23, and amending claims 1, 6, 24 and 25. A response to a July 1, 2009 Final Office Action was filed canceling claim 4, and amending claims 1, 5, and 6. In the Advisory Action of July 27, 2009, the Examiner entered the amendment. A Notice of Appeal was filed in response to the September 9, 2009 Advisory Action. A Request for Continued Examination was filed in lieu of an Appeal Brief, canceling claim 1, amending claims 2, 3, 5, 6, 15, 17 and 24, and adding new claims 58-62. A response to a December 28, 2009 non-final Office Action was filed canceling claim 62, and amending claims 19, 58, 60 and 61. A Request for Continued Examination was filed in response to the July 27, 2010 Advisory Action and May 5, 2010 Final Office Action canceling claim 62, amending claims 3, 2, 17, 19, 24, 58, 60 and 61 and adding new claims 63-78. A response to a September 15, 2010 non-final Office Action was filed amending claims 2, 3, 6, 15, 17, 58, 63-65, 68 and 70. A response to a November 23, 2010 Final Office Action was filed amending

claims 3, 58, 63 and 65. In the Advisory Action of December 7, 2010, the Examiner entered the amendment.

Accordingly, the claims attached hereto in Appendix A reflect the office action responses mentioned above.

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SUMMARY OF CLAIMED SUBJECT MATTER

The Application presently has two pending independent claim, namely, claims 58 and 63. Citations correspond to the replacement specification submitted June 13, 2008.

Independent claim 58 is directed to a pump for delivering a liquid containing a medicament, liquid drug, or drug solution to a human or animal patient (Page 9, lines 10-22). Referring to Figs 1, 2a-2c and 3 an actuator housing has a chamber 14 housing the liquid, the chamber having an inlet port 15 and an outlet port 16 for accommodating liquid flow through the chamber 14 (Page 17, line 21 to page 18, line 2; page 18, line 13 to page 19, line 2). A plurality of individual actuators 12a-e are arranged contiguously in a series and located in the chamber opposite to an inner surface and in contact with the liquid, wherein successive actuators in the series are sequentially expanded from a starting position toward the inner surface of the chamber to advance the flow of liquid through the chamber and out the outlet port. (Page 17, line 21 to page 18, line 2; page 18, line 13 to page 20, line 2). An activator 13 is provided for sequentially activating individual actuators, wherein each actuator comprises a reversibly responsive elastomeric material. (Page 6, line 19 to page 7, line 6; page 15, lines 3-8)

Independent claim 63 is directed to a pump for moving a liquid including an actuator housing having a chamber housing the liquid, the chamber 14 having an inlet port 15 and an outlet port 16 for accommodating liquid flow through the chamber 14 (Page 9, lines 10-22; page 17, line 21 to page 18, line 2; page 18, line 13 to page 19, line 2). A plurality of individual actuators comprise a reversibly responsive elastomeric material, wherein the plurality of individual actuators 12a-e are arranged in a series and located in the chamber opposite to an inner surface and in contact with the liquid, wherein each actuator is separated from the inner

surface of the chamber, and wherein successive actuators in the series are sequentially expanded from a starting position toward the inner surface of the chamber to advance the flow of liquid through the chamber and out the outlet port. (Page 17, line 21 to page 18, line 2; page 18, line 13 to page 20, line 2). An activator 13 is provided for sequentially controlling individual actuators. (Page 6, line 19 to page 7, line 6; page 15, lines 3-8).

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GROUND OF REJECTION TO BE REVIEWED ON APPEAL

The issues in this appeal are:

(1) whether claims 2, 3, 15, 17, 19-21, 24-26¹, 58-61, 63-65 and 70-78 are patentable over da Costa in view of Chinn, and further in view of Bar-Cohen, with regards to 35 U.S.C. § 103(a); and

(2) whether claims 5-7 and 65-69 are patentable over da Costa in view of Chinn and Bar-Cohen as applied to claim 4 [sic] and further in view of Culp with regards to 35 U.S.C. §103(a).

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¹ The Final Action Summary Form PTOL-326 includes claims 24-26; however, claims 24-26 are not mentioned in the detailed Action. Based on the earlier prosecution it is believed the Examiner intended to group claims 24-26 with the rejection based on da Costa and Chinn, and it has been so treated.

ARGUMENT

A. Claims 2, 3, 5-7, 17, 19-21, 24-26, 58-61 and 63-78

1. Case Law

It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly or explicitly, all elements/features/steps of the claim at issue. *See, e.g., In re Dow Chemical*, 5 U.S.P.Q. 2d 1529, 1531 (Fed. Cir. 1988), and *In re Keller*, 208 U.S.P.Q. 871, 881 (C.C.P.A. 1981). To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). If an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

2. US Patent Number 6,004,115 to da Costa (hereinafter, "da Costa") in view of US Patent Number 6,685,442 to Chinn et al. (hereinafter, "Chinn") and further in view of US Patent Number 5,961,298 to Bar-Cohen et al. (hereinafter, "Bar-Cohen")

On page 3 of the final Office Action, claims 2, 3, 15, 17, 19-21, 24-26¹, 58-61, 63-65 and 70-78 are rejected under 35 U.S.C. §103(a) as being unpatentable over da Costa in view of Chinn and further in view of Bar-Cohen.

¹ The Final Action Summary Form PTOL-326 includes claims 24-26; however, claims 24-26 are not mentioned in the detailed Action. Based on the earlier prosecution it is believed the Examiner intended to group claims 24-26 with the rejection based on da Costa and Chinn, and it has been so treated.

3. The Examiner's Rejection

It is stated in the final office action, on page 3, that:

"The da Costa references discloses a pump for moving fluid having an actuator housing (13) having a chamber (14, 15) with ports (11, 12) for accommodating the flow of fluid therethrough. There are a plurality of individual actuators (20) located in the chamber which form plural chambers (20) that house the fluid in flow connection. There is an activator including a controller (see the first full paragraph of col. 5) for controlling the actuation at a predetermined time and rate. Da Costa does not set forth that the actuator material is an electroactuated polymer gel, encased in an essentially inert material which is semi-permeable to electrolytes, the encasing material being non-permeable or the actuators being electrically shielded from a contiguous actuator. Further, da Costa does not set forth that the fluid is a liquid or disclose plural of the chambers in flow connection.

Chinn et al discloses an actuator, which may be used as a pump (col. 2, line 2) and includes an electro-actuated polymer gel housed in a non-conductive housing. The gel 10 is encased in a housing 20 which is chemically inert, the gel is encased within the housing by a member 24 which is semi-permeable to the electrolyte. This structure is also encased with a sealed conformal coating. Now especially the disclosure from col. 5, line 55 to col. 6 line 36. The Bar-Cohen et al reference discloses a similar traveling wave pump having a contiguous series of actuators 108 in contact with a fluid that is being pumped. Bar-Cohen et al note that the fluid can be a liquid or a gas (see line 2 of the Abstract at least) and also discloses plural chambers which either are or could be connection in flow connection in Figs. 5-9.

At the time of the invention it would have been obvious to one of ordinary skill in the art to substitute the plural actuators such as taught by Chinn et al for the actuators of da Costa since such a substitution would result in a miniature fluid device that is actuated with low electrical potentials and has significant performance characteristics (see col. 1 lines 30-35 and col. 2 lines 17-28 of Chinn). Additionally, it would have been obvious to one of ordinary skill in the art at the time of the invention that the pumping arrangement could be easily modified to pump liquids as taught by Bar-Cohen et al simply by making the actuators of similar size."

4. Discussion of the Cited References

Da Costa is directed to a hermetically sealed compressor for gases for a refrigeration system, having a plurality of pistons of piezoelectric material arranged within a hermetic shell.

(Abstract; Claim 1). As illustrated in FIGS. 1a-1f, the pistons are laterally adjacent to each other. (Col. 2, lines 52-55). Each piston reproduces the internal volume of the corresponding portion of the hermetic shell. (Col. 2, lines 55-60). Accordingly, each piston presents a progressively decreasing transversal section, from the first piston to the last piston of the longitudinal alignment to create a new volume of gas, which is reduced in volume from the previous volume of gas. (Col. 3, lines 53-57). The progressively decreasing transversal sections consequently increase the pressure of the gas contained in the volumes. (Col. 3, lines 57-59).

Chinn is not a pump. Rather, Chinn is an actuator valve based on a conductive polymer gel. (Abstract). The polymer gel acts as a seal or diaphragm to regulate or control flow through miniature actuator assemblies. (Col. 5, lines 44-46). A plug assembly within the actuator valve is immersed in an electrolyte solution having charge balancing ions, which are moved between various chambers in the plug assembly. (Col. 5, lines 55-67).

Bar-Cohen is directed to a traveling wave pump having electroactive actuators. (Abstract). The wave pump includes a driven plate and a fixed plate which are pressed together to form an interface. (Col. 4, lines 41-44). An inlet and an outlet are located at each end of the interface. (FIG. 1; Col. 4, lines 47-49). A plurality of actuators drive or excite the driven plate. (Col. 4, lines 45-47). Movement of the plurality of actuators creates a traveling wave, which propagates from the inlet side of the pump and moves towards the outlet side. (Col. 5, lines 43-45). The wave causes chambers to form between the driven plate and the fixed plate, along the interface, which carries a fluid from the inlet to the outlet. (Col. 5, lines 58 – Col. 6, line 9). Fluid traveling in chambers along the interface are in contact with the driven and fixed plates, but do not contact the actuators (FIG. 1).

5. Patentable Distinctions Between the Present Claims and the Cited References

Appellant respectfully submits that independent claims 2, 3, 15, 17, 19-21, 24-26¹, 58-61, 63-65 and 70-78 are patentably distinguishable over the applied art in that claims 2, 3, 15, 17, 19-21, 24-26¹, 58-61, 63-65 and 70-78 recite features that are neither disclosed, taught, nor suggested by the prior art of record.

6. Independent Claim 58

Appellant respectfully submits that independent claim 58 is patentably distinguishable over the art of record in that independent claim 58 recites features that are neither disclosed, taught, nor suggested by the prior art of record. Independent claim 58, which is set forth below for the convenience of the Board provides as follows:

Claim 58: A pump for delivering a liquid containing a medicament, liquid drug, or drug solution to a human or animal patient, comprising:

- a. an actuator housing having a chamber housing the liquid, the chamber having an inner surface and an outlet port for accommodating liquid flow through the chamber;
- b. a plurality of individual actuators arranged contiguously in a series and located in the chamber opposite to the inner surface and in contact with the liquid, wherein successive actuators in the series are sequentially expanded from a starting position toward the inner surface of the chamber to advance the flow of liquid through the chamber and out the outlet port; and
- c. an activator for sequentially activating individual actuators, wherein each actuator comprises a reversibly responsive elastomeric material.

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¹ The Final Action Summary Form PTOL-326 includes claims 24-26; however, claims 24-26 are not mentioned in the detailed Action. Based on the earlier prosecution it is believed the Examiner intended to group claims 24-26 with the rejection based on da Costa and Chinn, and it has been so treated.

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**a. The combination of references fails to disclose every
requirement of claim 58**

The Examiner's rejection of independent claim 58 is in error, since the combination of references cited under the §103(a) rejection fail to disclose, teach, or suggest, either implicitly or explicitly, every element of claim 58. Claim 58 requires, in part, "a plurality of individual actuators arranged contiguously in a series and located in the chamber opposite to the inner surface and in contact with the liquid." In finally rejecting claim 58, the Examiner acknowledges that neither the primary reference da Costa, nor the secondary reference Chinn et al. teaches this claim feature. However, the Examiner contends this claim feature is taught by Bar-Cohen, asserting, on pages 3-4 of the Final Office Action², "[t]he Bar-Cohen et al reference discloses a similar traveling wave pump having a contiguous series of actuators 108 in contact with a fluid that is being pumped." The Examiner does not contend that any other reference teaches a plurality of individual actuators arranged contiguously in a series, and in contact with the liquid.

The Examiner's assertion is erroneous, as Bar-Cohen fails to disclose a plurality of individual actuators that are in contact with the liquid. Bar-Cohen discloses a contiguous series of actuators 108 is illustrated in FIG. 1 of Bar-Cohen, and provided herein for convenience:

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² The Final Office Action was issued on November 23, 2010.

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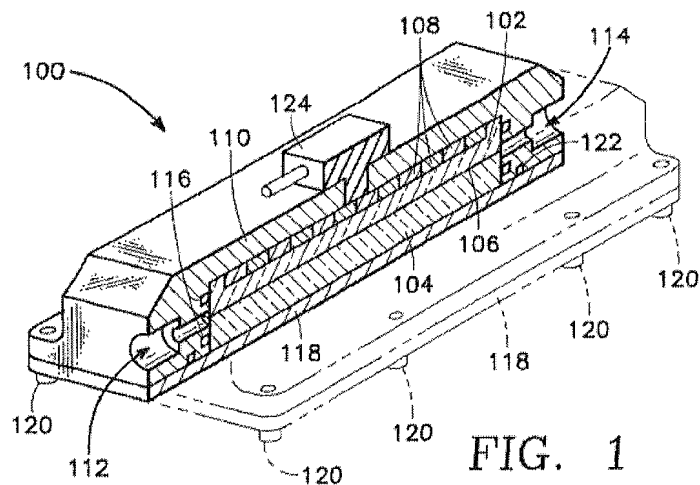


FIG. 1

As is described in at least Col. 4, lines 41-46 of Bar-Cohen, the pump 100 includes a driven plate 102, which is tightly pressed against a fixed plate 104 to form an interface 106. The driven plate 102 is excited by a series of actuators 108 attached to the side of the driven plate 102. Bar-Cohen teaches that fluid (i.e., gas or liquid) is pumped between the plates 102, 104. *See Abstract*; Col. 4, lines 52-53. This is accomplished by creating a flexure traveling wave in the driven plate 102 that causes chambers 218 (FIG. 2) to be formed at the interface 106 between the plates 102, 104. FIG. 2 illustrates the chamber 218 created between the plates 202, 204 that the fluid travels along. *See Col. 5, line 58 to Col. 6, line 9.*

It is evident from the figures and written description of Bar-Cohen that any fluid within the pump, whether gas or liquid, is moved along the interface 106 formed between the driven plate 102 and the fixed plate 104, and thus, does not contact the plurality of actuators 108. The fluids contact with the pump 100 is limited to the inlet 112, the interface 106 formed between the plates 102, 104, and the outlet 114, as is clearly understood from FIG. 1. Furthermore, every other embodiment of Bar-Cohen teaches that fluid is moved along an interface between two plates, and never contacts a single actuator, let alone a plurality of actuators³. Therefore,

³ *See Bar-Cohen, FIGS. 4, 7-9.*

the Examiner's finding that Bar-Cohen teaches a contiguous series of actuators 108 in contact with a fluid, is simply incorrect. None of the addition references, da Costa and Chinn, whether alone, together or in combination Bar-Cohen, teach this limitation of claim 58. Accordingly, for at least this reason, the Appellant submits that the Examiner's rejection under §103(a) is in error.

b. The references are not suitable for combination

Additionally, the combination of references cited by the Examiner is in error, since the combination of da Costa, Chinn and Bar-Cohen would render the disclosure of da Costa unsatisfactory, and ultimately inoperable for its intended purpose. *See* MPEP §2143.01(V). da Costa teaches a hermetically sealed refrigeration system compressor using a piezoelectric material as pistons to move and compress a gas. *See* Abstract. Successive pistons in da Costa provide a smaller and smaller volume, as may be seen from FIGS. 1a-1f and Col. 3, lines 53-59 of da Costa. It is well known by those skilled in the art that a liquid essentially is incompressible. The refrigeration compressor taught by da Costa uses a gas and could not function with a liquid.

The pump of da Costa cannot be combined with the teachings of Chinn or Bar-Cohen, or any other piece of art that provides a housing that maintains a constant volume, to provide a pump that advances the flow of liquid through the chamber and out the outlet port, as is required by claim 58. da Costa has a stated intended purpose of being used as a compressor for refrigeration systems. *See* Title; Abstract. Substituting a series of actuators that creates a housing with an equal volume would render da Costa inoperable, since housings with equal volumes would be incapable of decreasing the volume of the gas refrigerant of da Costa, thus failing to provide, "high pressure pumping" which da Costa requires. *See* Abstract.

da Costa functions on the principle that high pressure changes and changes of volume of fluid displaced are required in refrigeration compressors to allow the temperature change of the refrigeration fluid that drives the cooling action of the refrigerator. If the compressor of da Costa was combined with the Chinn and Bar-Cohen pumps, the resulting compressor could not function properly. The pumps of Chinn and Bar-Cohen are incapable of compressing liquid as required by da Costa, and therefore would fail to provide the necessary pressure changes that da Costa's refrigeration system requires. Thus, the Examiner's combination of da Costa with Chinn and Bar-Cohen would make the compressor of da Costa inoperable. It is well established that "an inoperable invention or one which fails to achieve its intended result does not negative novelty." *U.S. v. Adams*, 383 U.S. 39, 50, (1966) (citing *Smith v. Snow*, 294 U.S. 1, 17 (1935)).

For the reasons stated herein, the rejection of claim 58 as being unpatentable over da Costa in view of Chinn, and further in view of Bar-Cohen is in error. Accordingly, reversal of the rejection is respectfully requested.

7. Independent Claim 63

Appellant respectfully submits that independent claim 63 also is patentably distinguishable over the applied art in that independent claim 63 recites features that are neither disclosed, taught, nor suggested by the prior art of record. Independent claim 63 is set forth below.

Independent claim 63 provides as follows:

Claim 63: A pump for moving a liquid, comprising:
a. an actuator housing having a chamber housing the liquid, the chamber having an inner surface and an outlet port for accommodating liquid flow through the chamber;
b. a plurality of individual actuators comprising a reversibly responsive elastomeric material, wherein the plurality of individual actuators are arranged in a series and located in the chamber opposite to

the inner surface and in contact with the liquid, wherein each actuator is separated from the inner surface of the chamber, and wherein successive actuators in the series are sequentially expanded from a starting position toward the inner surface of the chamber to advance the flow of liquid through the chamber and out the outlet port; and

c. an activator for sequentially controlling individual actuators.

The Examiner's rejection of independent claim 63 is in error, since the combination of references cited under the §103(a) rejection fail to disclose, teach, or suggest, either implicitly or explicitly, every element of claim 63. Claim 63 requires the same limitations as discussed above with respect to claim 58, and the Examiner rejects claim 63 based on the same reasons as the rejection of claim 58. Accordingly, for at least the reasons stated above with respect to claim 58, *da Costa* in view of *Chinn*, and further in view of *Bar-Cohen* fail to support the rejection of claim 63 and the Examiner's rejection is in error. Accordingly, reversal of the rejection is respectfully requested.

8. Claims 2, 3, 15, 17, 19-21, 24-26¹, 59-61, 64-65 and 70-78

The Appellant submits that claims 2, 3, 15, 17, 19-21, 24-26¹, 59-61, 64-65 and 70-78 are allowable for at least the reason that they depend either directly or indirectly from allowable independent claims 58 or 63, as the case may be. *In re Fine*, 5 U.S.P.Q. 2d 1596, 1608 (Fed. Cir. 1988).

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¹ The Final Action Summary Form PTOL-326 includes claims 24-26; however, claims 24-26 are not mentioned in the detailed Action. Based on the earlier prosecution it is believed the Examiner intended to group claims 24-26 with the rejection based on *da Costa* and *Chinn*, and it has been so treated.

¹ The Final Action Summary Form PTOL-326 includes claims 24-26; however, claims 24-26 are not mentioned in the detailed Action. Based on the earlier prosecution it is believed the Examiner intended to group claims 24-26 with the rejection based on *da Costa* and *Chinn*, and it has been so treated.

B. Claims 5-7 and 65-69

1. Da Costa in view of Chinn and Bar-Cohen, as applied to claim 4 [sic]⁴, and further in view of U.S. Patent Number 5,192,197 to Culp (hereinafter, "Culp")

On pages 4-5 of the final Office Action, claims 5-7 and 65-69 are rejected under 35 U.S.C. §103(a) as being unpatentable over da Costa in view of Chinn and Bar-Cohen as applied to claim 4, and further in view of Culp.

2. Patentable Distinctions Between the Present Claims and the Cited References

Claims 5-7 and 65-69 are dependent, either directly or indirectly, on independent claims 58 and 63, as the case may be. As argued above, the rejection of independent claims 58 and 63 under §103(a) as being unpatentable over da Costa in view of Chinn and further in view of Bar-Cohen is in error. As claims 5-7 and 65-69 depend on independent claims 58 and 63, as the case may be, they include all limitations of independent claims 58 and 63. The additional reference, Culp, fails to overcome the shortcomings of the da Costa/Chinn/Bar-Cohen combination. Therefore, claims 5-7 and 65-69 are allowable for at least the reason that they depend from at least one of allowable independents claim 58 and 63. *In re Fine*, 5 U.S.P.Q. 2d 1596, 1608 (Fed. Cir. 1988).

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⁴ Claim 4 has been cancelled. Claims 5-7 are indirectly dependent on claim 63, and claims 65-69 are directly or indirectly dependent on claim 58. The rejection has been treated as reading on claim 58 or 63, as the case may be.

CLAIMS APPENDIX

Claim 1 (cancelled).

Claim 2 (previously presented): The pump of Claim 63 wherein the actuator housing comprises two or more chambers for housing the liquid in flow connection.

Claim 3 (previously presented): The pump of Claim 63 wherein the activator is designed to activate individual actuators at a time and sequence selected to displace the liquid at a chosen rate.

Claim 4 (cancelled)

Claim 5 (previously presented): The pump of Claim 59 wherein the controller is a programmable microprocessor in electrical connection with the activator.

Claim 6 (previously presented): The pump of Claim 59 comprising in addition a sensor for determining physical properties of the liquid wherein the sensor is in electrical connection with the controller and is capable of delivering signals received from the liquid to the controller.

Claim 7 (previously presented): The pump of Claim 6 wherein the physical properties to be sensed are selected from the group consisting of chemical composition, pH, pressure, temperature and flow rate.

Claim 8 (withdrawn): A pump for moving a fluid in a determined path comprising the pump of Claim 1 wherein the positions of the actuators in the actuator housing are selected to define the flow path for the liquid when displaced.

Claim 9 (withdrawn): The pump of Claim 8 wherein the actuator housing comprises more than one inlet port each port being capable of receiving an individual fluid and wherein individual flow paths are determined for each fluid.

Claim 10 (withdrawn): The pump of Claim 8 comprising two or more outlet ports.

Claim 11 (withdrawn): The pump of Claim 9 wherein the flow paths of individual liquids are allowed to intersect and thereby allow mixing of the displaced fluids.

Claim 12 (withdrawn): A pump for moving a fluid at a determined rate and in a determined path comprising the pump of Claim 1 wherein said actuator sequentially activates individual contiguous actuators at a selected time and the actuators are located on one or more walls of the inner cavity at positions selected to define a flow path for the displaced liquid when the actuators are activated.

Claim 13 (withdrawn): The pump of Claim 1 wherein the actuator housing is located inside a chamber containing the fluid, the chamber being a component of an on-line fluid processing system and the inlet port and outlet ports of the actuator housing are on the axis of flow in the fluid processing system.

Claim 14 (withdrawn): The pump of Claim 1 comprising in addition a connector for coupling the actuator housing into an on-line processing system.

Claim 15 (previously presented): The pump of Claim 63 wherein at least one of said actuators is positioned near the inlet port of the actuator housing and, when activated, forms a barrier preventing backflow of liquid from the actuator housing.

Claim 16 (withdrawn): The pump of Claim 1 comprising in addition an elastomeric impermeable lining located between the actuators and the housed fluid to prevent contact of the actuators and the fluid.

Claim 17 (previously presented): The pump of Claim 63 wherein the actuators are essentially inert and non-reactive with the liquid.

Claim 18 (withdrawn): The pump of Claim 16 wherein the actuators are biocompatible.

Claim 19 (previously presented): The pump of Claim 63 wherein individual actuators are each encased in an essentially inert material.

Claim 20 (previously presented): The pump of Claim 19 wherein the material is semi-permeable to electrolytes.

Claim 21 (original): The pump of Claim 17 wherein the material is non-permeable.

Claims 22 - 23 (cancelled)

Claim 24 (previously presented): The pump of Claim 63, wherein each actuator is electrically shielded from contiguous actuators.

Claim 25 (previously presented): The pump of Claim 24, comprising an electrical circuit for activating individual actuators at a determined time.

Claim 26 (previously presented): The pump of Claim 25 comprising in addition a microprocessor in electrical contact with the electrical circuit, the microprocessor being programmed to drive the electrical circuit at a determined time whereby individual actuators are activated at a determined time and sequence.

Claim 27 (withdrawn): The pump of Claim 1 wherein the actuators comprise electroactive gels that are activated by contact with electrolyte.

Claim 28 (withdrawn): The pump of Claim 27 comprising a reservoir for housing an electrolytic solution.

Claim 29 (withdrawn): The pump of Claim 28 comprising a permeable frit between the actuator and the electrolytic solution.

Claim 30 (withdrawn): The pump of Claim 1 wherein the actuators are polymer gels activated by contact with an electrolytic solution, individual polymers are each encased with a semi-permeable material, the actuator housing comprises a reservoir for housing electrolytic solution and a frit located between the reservoir and the actuator and the activator means is an electrical circuit whereby electrolytic solution is caused to flow through the frit and semi-permeable material from the reservoir into contact with the polymer and away from the polymer to cause reversible dimension change of the actuator.

Claim 31 (withdrawn): The pump of Claim 30 wherein the electrical circuit is operated by a remote control device.

Claim 32 (withdrawn): The pump of Claim 31 wherein the remote control device is infra-red or radio-frequency driven.

Claim 33 (withdrawn): The pump of Claim 31 wherein the remote control device comprises a microprocessor programmed to activate the actuators at a selected time and sequence.

Claim 34 (withdrawn): The pump of Claim 1 wherein the actuators comprise optically responsive polymers.

Claim 35 (withdrawn): The pump of Claim 34 wherein the optically responsive polymers are ionized in the presence of light.

Claim 36 (withdrawn): The pump of Claim 34 wherein the optically responsive polymers change pH in the presence of light.

Claim 37 (withdrawn): The pump of Claim 36 wherein the polymers comprise anthracene.

Claim 38 (withdrawn): The pump of Claim 34 wherein the activation of the optically active polymers is controlled by exposure to a laser beam of specific wavelength, natural light, a LED or a quantum light source.

Claim 39 (withdrawn): The pump of Claim 38 wherein the time of light exposure is controlled by a remote control device.

Claim 40 (withdrawn): The pump of Claim 39 wherein the remote control device is infra-red or radio-frequency driven.

Claim 41 (withdrawn): The pump of Claim 34 wherein the control device is driven by a microprocessor, programmed to activate the actuators at a selected time and sequence.

Claim 42 (withdrawn): The pump of Claim 1 wherein the actuators comprise electroactive polymers that a directly activated by signal from an electrical circuit.

Claim 43 (withdrawn): The pump of Claim 1 wherein the actuators comprise a chemically activated polymer.

Claim 44 (withdrawn): The pump of Claim 1 wherein the actuators comprise a magnetically active polymer.

Claim 45 (withdrawn): The pump of Claim 1 wherein the actuators comprise a thermally active polymer.

Claim 46 (withdrawn): The pump of Claim 1 wherein the actuators comprise shape memory alloys.

Claim 47 (withdrawn): The pump of Claim 1 wherein the actuators comprise ceramic piezoelectric actuator.

Claim 48 (withdrawn): The pump of Claim 1 wherein the actuators comprise polymer/ceramic piezoelectric combinations.

Claim 49 (withdrawn): The pump of Claim 11 as a fluid mixing device.

Claim 50 (withdrawn): A pump for propelling an object along a surface comprising:

- a. an actuator housing in contact with the object;
- b. a plurality of contiguous actuators in contact with the actuator housing and in contact with the surface; and
- c. an activator for sequentially activating individual actuators, wherein each actuator, when activated, changes dimensions and exerts a displacing force on the surface and thereby propels the solid object in a direction opposite that of the displacing force.

Claim 51 (withdrawn): The pump of Claim 50 for propelling an object suspended on a liquid surface.

Claim 52 (withdrawn): The pump of Claim 50 for propelling an object suspended on a solid surface.

Claim 53 (withdrawn): The pump of Claim 50 for propelling an object submerged in a liquid.

Claim 54 (withdrawn): A method of pumping a fluid at a controlled rate comprising placing the actuator housing of Claim 1 into fluid contact with the fluid, activating a first actuator to prevent back-flow from the actuator housing and then repeatedly activating the contiguous actuators at a sequence wherein activation of one of the individual actuators occurs at a time after one of its contiguous actuators has been activated.

Claim 55 (withdrawn): The method of Claim 54 for pumping fluids of different viscosities wherein the pump comprises two or more actuator housings in fluid connection and each actuator housing is operated at a different flow rate.

Claim 56 (withdrawn): The pump of Claim 1 as an implantable infusion pump.

Claim 57 (withdrawn): The pump of Claim 1 as a drug delivery device for delivering a liquid drug or drug solution at a controlled rate and at a controlled time to an individual wherein the actuator housing comprises a single outlet port but no inlet port and houses the liquid drug or drug solution to be delivered.

Claim 58 (previously presented): A pump for delivering a liquid containing a medicament, liquid drug, or drug solution to a human or animal patient, comprising:

- a. an actuator housing having a chamber housing the liquid, the chamber having an inner surface and an outlet port for accommodating liquid flow through the chamber;
- b. a plurality of individual actuators arranged contiguously in a series and located in the chamber opposite to the inner surface and in contact with the liquid, wherein successive actuators in the series are sequentially expanded from a starting position toward the inner surface of the chamber to advance the flow of liquid through the chamber and out the outlet port; and
- c. an activator for sequentially activating individual actuators, wherein each actuator comprises a reversibly responsive elastomeric material.

Claim 59 (previously presented): A pump of Claim 63 comprising in addition a controller for the actuator whereby individual actuators are activated at a determined time.

Claim 60 (previously presented): The pump of Claim 63 wherein the reversibly responsive elastomeric material is selected from the group consisting of an electroactive

polymer, an electrolytically activated polymer gel, an optically activated polymer, a piezoelectric polymer, a piezoelectric ceramic material, a chemically activated polymer, a magnetically activated polymer, a magnetically activated polymer and a shape memory polymer.

Claim 61 (previously presented): The pump of Claim 63 wherein the actuators comprise an electroactive polymer.

Claim 62 (cancelled).

Claim 63 (previously presented): A pump for moving a liquid, comprising:

- a. an actuator housing having a chamber housing the liquid, the chamber having an inner surface and an outlet port for accommodating liquid flow through the chamber;
- b. a plurality of individual actuators comprising a reversibly responsive elastomeric material, wherein the plurality of individual actuators are arranged in a series and located in the chamber opposite to the inner surface and in contact with the liquid, wherein each actuator is separated from the inner surface of the chamber, and wherein successive actuators in the series are sequentially expanded from a starting position toward the inner surface of the chamber to advance the flow of liquid through the chamber and out the outlet port; and
- c. an activator for sequentially controlling individual actuators.

Claim 64 (previously presented): The pump of Claim 58 wherein the actuator housing comprises two or more chambers for housing the liquid in flow connection.

Claim 65 (previously presented): The pump of Claim 58 wherein the activator is designed to activate individual actuators at a time and sequence selected to displace the liquid at a chosen rate.

Claim 66 (previously presented): A pump of Claim 58 comprising in addition a controller for the actuator whereby individual actuators are activated at a determined time.

Claim 67 (previously presented): The pump of Claim 66 wherein the controller is a programmable microprocessor in electrical connection with the activator.

Claim 68 (previously presented): The pump of Claim 66 comprising in addition a sensor for determining physical properties of the fluid wherein the sensor is in electrical connection with the controller and is capable of delivering signals received from the liquid to the controller.

Claim 69 (previously presented): The pump of Claim 68 wherein the physical properties to be sensed are selected from the group consisting of chemical composition, pH, pressure, temperature and flow rate.

Claim 70 (previously presented): The pump of Claim 58 wherein the actuators are essentially inert and non-reactive with the liquid.

Claim 71 (previously presented): The pump of Claim 58 wherein individual actuators are each encased in an essentially inert material.

Claim 72 (previously presented): The pump of Claim 71 wherein the material is semi-permeable to electrolytes.

Claim 73 (previously presented): The pump of Claim 70 wherein the material is non-permeable.

Claim 74 (previously presented): The pump of Claim 58, wherein each actuator is electrically shielded from contiguous actuators.

Claim 75 (previously presented): The pump of Claim 74, comprising an electrical circuit for activating individual actuators at a determined time.

Claim 76 (previously presented): The pump of Claim 25 comprising in addition a microprocessor in electrical contact with the electrical circuit, the microprocessor being programmed to drive the electrical circuit at a determined time whereby individual actuators are activated at a determined time and sequence.

Claim 77 (previously presented): The pump of Claim 58 wherein the reversibly responsive elastomeric material is selected from the group consisting of an electroactive polymer, an electrolytically activated polymer gel, an optically activated polymer, a piezoelectric polymer, a piezoelectric ceramic material, a chemically activated polymer, a magnetically activated polymer, a magnetically activated polymer and a shape memory polymer.

Claim 78 (previously presented): The pump of Claim 58 wherein the actuators comprise an electroactive polymer.

EVIDENCE APPENDIX

None submitted by the Appellant and none entered by the Examiner.

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RELATED PROCEEDINGS APPENDIX

No related proceedings exist or existed.

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CONCLUSION

In view of the foregoing, it is respectfully requested that the Examiner's rejection of the subject application be reversed.

Fees to cover the Appeal Brief, in the amount of \$270.00 is being paid via EFS-WEB.

In the event there are any fee deficiencies or additional fees are payable, please charge them (or credit any overpayment) to our Deposit Account Number 08-1391.

Respectfully submitted,



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CERTIFICATE OF ELECTRONIC FILING

I hereby certify that this correspondence is being deposited within the United States Patent Office via the electronic filing procedure on December 23, 2010

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